Comments on the "Jackpile Paguate Uranium mine Site Expanded Site Inspection, Draft Conceptual Side Model, Paguate, Cibola County, New Mexico"

Tanya Gallegos, USGS, Denver

1. It may be helpful to establish separate background wells: one that is screened in the Jackpile aquifer interval and a second screened in the alluvial aquifer, all away from the mine site. The data presented here does not rule out a natural contribution of uranium to the alluvial aquifer.
2. Assumptions were made that the "relatively anoxic environment is not conducive to uranium dissolution". What is the redox condition to support this argument (e.g. ORP, Eh or dissolved O_2, etc.)?
3. The suspect data (e.g. 2007 ROD Data) should not be used in the evaluation (p. 3-7) even to show qualitative "trends". The data may have been incorrectly collected or samples incorrectly treated (e.g. should've been filtered with 0.45 micron filter and properly preserved) resulting in the elevated concentrations, making even qualitative comparisons unjustified.
4. p. 2-1: The statement: "Uranium is a divalent cation" is incorrect. It should read: "Uranyl (UO_2^{2+}) is a divalent cation".
5. Figure 5. Well screened interval would be helpful to see. Also, label should read Brushy Basin member.
6. Often times, uranium and radium have opposite solubility trends based on redox condition, depending on the presence of anions such as sulfate. It may be helpful to see these data, as well.
7. Uranium isotopes, may be helpful in establishing the relationship between anthropogenic and natural groundwater. Were these data collected?
8. p. 4-2. Note that the crustal abundance of uranium is around 3 ppm U.
9. p. 4-2 suggests that the sampling be limited to surface salts. However, it would be beneficial to understand the geochemical signatures of potential sources - both whole rock and leachates. The fluvial sandstones of the Morrison Formation that host significant amounts of uranium ore include the Westwater Canyon Member and the Jackpile sandstone of economic usage. If these wells were screened in the Jackpile, there could be contributions from natural sources in the subsurface. Alternatively, Uranium may be weathered from exposed sources and transported physically through dust as well as chemically through contact with rain. The surficial sediments may not reflect this if there was downward migration of the contaminants of concern. A systematic characterization the chemical and isotopic signatures of the various components in the Jackpile-Mine system, may shed additional light on the sources and sinks. Samples could include: samples from exposed outcrops from the various geologic (and potentially uranium-bearing) units, mine waste sources, dusts, evaporated crusts adjacent to waste piles, salts. Collecting samples through the alluvium (augered or drilled to depth) may also provide a better understanding of the downward migration of contaminants. For example, some studies have demonstrated that uranium may accumulate in the vadose zone from series of leaching of near surface materials and subsequent evaporation cycles. Uranium can also be taken up in other minerals including iron oxides.

Tanya J. Gallegos, Ph.D., P.E.
U.S. Geological Survey
Central Energy Resources Team
Box 25046, Mail Stop 973
Denver, CO 80225-0046

Phone: 303-236-1914
Fax: 303-236-1983
Email: tgallegos@usgs.gov
http://geology.usgs.gov/postdoc/profiles/gallegos/index.html